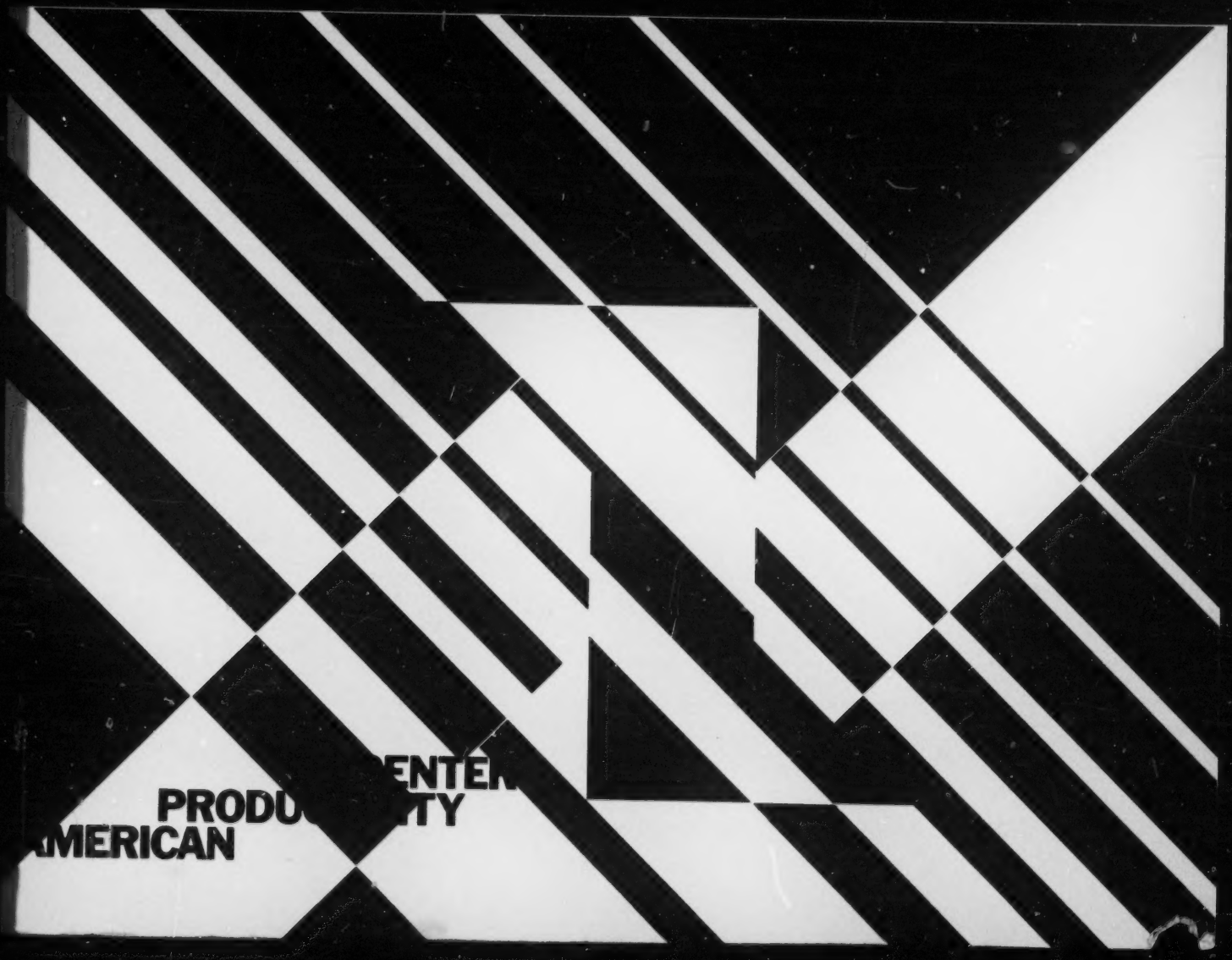
Productivity Perspectives



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This report was prepared by George E. Sadler and Carl E. Steidtmann, economists for the American Productivity Center, with assistance from Carl G. Thor, vice president-measurement. Editor was Carol J. Davis, director of publications, with production assistance from Cheryl Hoffman, Connie Einkauf and Joyce Shepherd.

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Introductory Note

The major thrust of the presentation and analysis of U.S. and world productivity dynamics as presented in the 1981 issue remains relevant and useful.

However, since data were assembled for "Productivity Perspectives: 1981", there have been some significant revisions in published data. In addition, several new series relating to international comparisons have become available.

Hence, this 1982 "update" issue will be organized in two parts:

- Part I focuses on entirely new series and material which has been significantly revised;
- Part II presents updated statistics keyed to the figures as presented in Productivity Perspectives 1981. These data have value as they stand but can also be combined with the appropriate data and interpretation presented in the 1981 edition.

The U.S. Productivity Experience

U.S. Economy in the Early 1980s

The initial OPEC embargo of October 1973 and the subsequent crude oil price escalation dealt a swift blow to the international economy, as economic output declined and the industrial world slipped into an 18-month recession in the fall of 1973.

The second OPEC oil price shock, driven by Iranian events of Fall 1979, again brought rapid escalation of energy prices and led to industrial output declines and the first dip of the double-dip recession of 1980-81. The initial sharp but short economic decline in 1980 (second quarter) was followed by a modest recovery through the second quarter of 1981, amid hopes for averting a full-scale world economic disaster.

However, the tenfold escalation of energy prices between 1973 and 1982, combined with errant monetary and fiscal policies on the national level, led to a sharper drop-off after mid-year 1981. This second dip of the recession has grown into the worst economic setback the U.S. and other free-world industrial nations have witnessed since the Great Depression of the '30s.

The transfer of billions of dollars of national wealth and purchasing power from the non-oil-producing nations to the members of the OPEC cartel during the years after 1973 brought a startling a decline in the industrial nations' share of the world's wealth (as measured in international bank reserves). (Figure 1.)

Figure 1 Percent of international bank reserves

	1972	1978	Nov. 1981
Industrial Nations	75%	62%	57%
Developing Nations (no oil)	17	21	19
Oil-Exporting Nations	7	16	22
Other/Roundoff	1	1	2
	100%	100%	100%

As a result of the huge escalation in energy prices, there has been a sharp curtailment in energy usage, and a thoroughgoing disruption of past industrial practices. Interest rates, inflation and unit costs soared to levels unheard of in the U.S. in any peacetime period. The long-term tradeoff of labor for capital in the form of improved machinery and equipment ended abruptly, as the more energy-guzzling machines were prematurely retired, and the expense of new capital investment outstripped even the rising costs of labor.

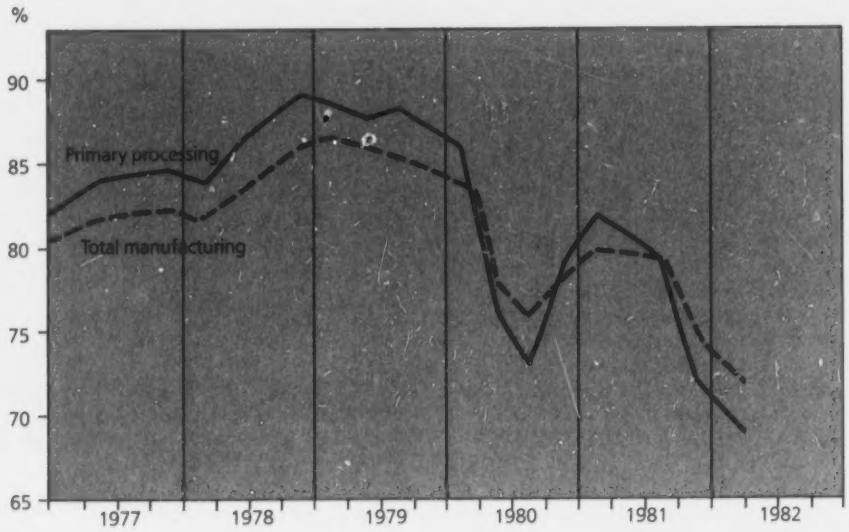
The combination of escalating prices, costs and interest rates choked off the demand for basic consumer goods, especially "big-ticket" items such as homes, automobiles and appliances. For business, sharp price increases and higher money cost translated into a rapidly escalating "hurdle rate for new capital investment."

By the third quarter of 1981, the second phase of the "double dip" recession was fully underway, with major drop-offs in sales, output, plant capacity utilization and employment. Real GNP dropped to a level in the fourth quarter of 1981 comparable to that of fourth quarter of 1980. Unemployment rose to levels higher than any since the 1930s. Prices continued to rise, though at slightly lesser rates. Interest rates reached historical highs in mid-year 1981 and remained unchanged into mid-1982. Despite a substantial drop in the second half of 1982, interest rates were still above those considered "normal" as recently as 1978.

Despite continuing forecasts of recovery "just around the corner," the economy failed to recover in the first three quarters of 1982. Unemployment rose to new highs as an expanding labor force chased a shrinking number of jobs. In the third quarter unemployment reached a new high of over 11 million persons, more than 10 percent of the civilian labor force.

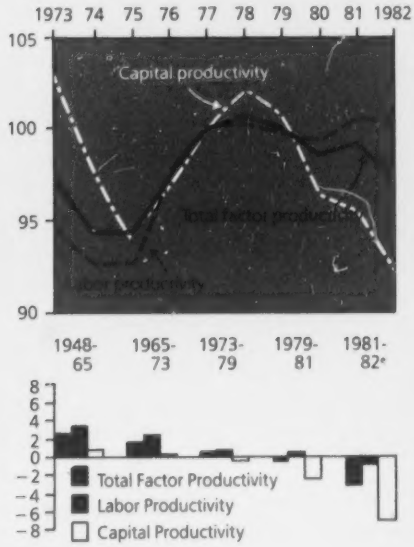
Declining domestic and world demand forced a growing number of plant shutdowns and the bankruptcies of small, medium and even some large firms. Utilization of manufacturing plant capacity fell still further, to a level under 70 percent, well below the lowest levels of the '74-'75 reces-

Figure 2 Capacity Utilization Rates



Source: Federal Reserve Board

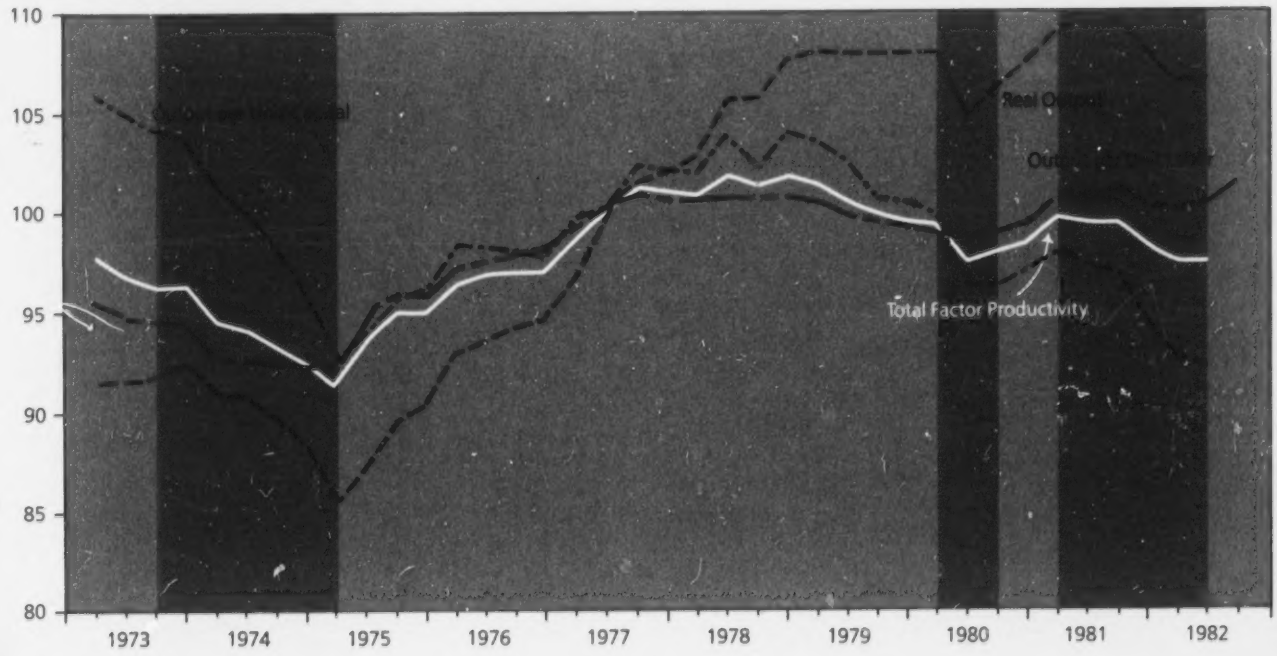
Figure 3 Trends in Total Factor Capital & Labor Productivity: Private Business Economy



e = estimated

Source: American Productivity Center

Figure 4 Trends in Real Output and Productivity in the U.S. Business Economy by Quarter: 1973-1982



Source: American Productivity Center

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sion, and the lowest recorded since the 1930s. While increases in both consumer and producer prices slowed, interest rates held stubbornly at rates far too high to encourage the consumer demand, large-scale construction or production necessary to pull out of the recession. (Figure 2.)

U.S. Productivity Dynamics in the Late '70s and Early '80s

Revised statistics show productivity growth rates for the years 1973-79 for the U.S. business economy averaged 0.4 percent per year (total factor) and 0.8 percent per year (labor productivity). While positive, these growth rates are only a fraction of the pace of productivity in earlier post-war years. Annual data for 1973-81 is presented in Figure 3. During the first half of 1982, total factor productivity dropped sharply, falling at an annual rate of -3.0 percent, while labor productivity remained flat at 0.8 percent. Quarterly data since 1973 are shown in Figure 4. In both figures, the relatively larger declines for capital productivity—and hence for total factor productivity—are directly related to the continuing shortfall in utilization of production facilities.

Preliminary data just released by the Bureau of Labor Statistics show a strong labor productivity increase in the third quarter of 1982, following the relatively flat performance in the first half of the year. The increase is due almost entirely to sharp declines in hours paid for, which more than compensated for drops in output in some segments and for modest increases in others. (Figure 5.)

Figure 5 Third quarter 1982 changes in output, labor and productivity

	Average annual percent of change:		
Preliminary Data Third Quarter, 1982	Output	Hours	Output per Hour
Business economy	1.4%	−2.5%	4.0%
Non-farm business	0.7	−1.9	3.6
Manufacturing	−1.9	−8.5	7.1

Figure 6 Decline in hours paid for

	Percent change in hours paid for*					
	1981-II	1981-III	1981-IV	1982-I	1982-II	1982-III
Business economy	−0.1%	0.8%	− 3.6%	− 4.5%	−0.8%	− 2.5%p
Non-farm business	0.5	0.6	− 3.7	− 4.7	−0.1	− 2.8p
Manufacturing	3.6	−0.3	−11.4	−11.7	−5.8	− 8.5p
Unemployment	6/81	9/81	12/81	3/82	6/82	9/82
Percent of civilian labor force	7.4%	7.6%	8.8%	9.0%	9.5%	10.5%
Number Unemployed (000)	8,004	8,236	9,571	9,854	10,427	11,000+

Source: Bureau of Labor Statistics
*Percent change from previous quarter at annual rates

The third quarter drop in hours came on top of earlier declines in each of the three preceding quarters (for the business economy and non-farm industry) and the four previous quarters for manufacturing industry, as industrial managers reduced labor and other costs in the face of continuing drops in demand for their product. (Figure 6.)

The preliminary third quarter productivity figures quoted above are subject to perhaps substantial adjustments by the BLS. However, the indication is that industrial management has been successful in reducing costs in their effort to remain competitive—but at a substantial social cost and reduction in the U.S. citizens' standard of living.

In its October 1982 "Pocket Chartroom," Goldman Sachs emphasizes another element in the present productivity picture which is contributing to a stronger productivity growth pattern than would otherwise be expected.

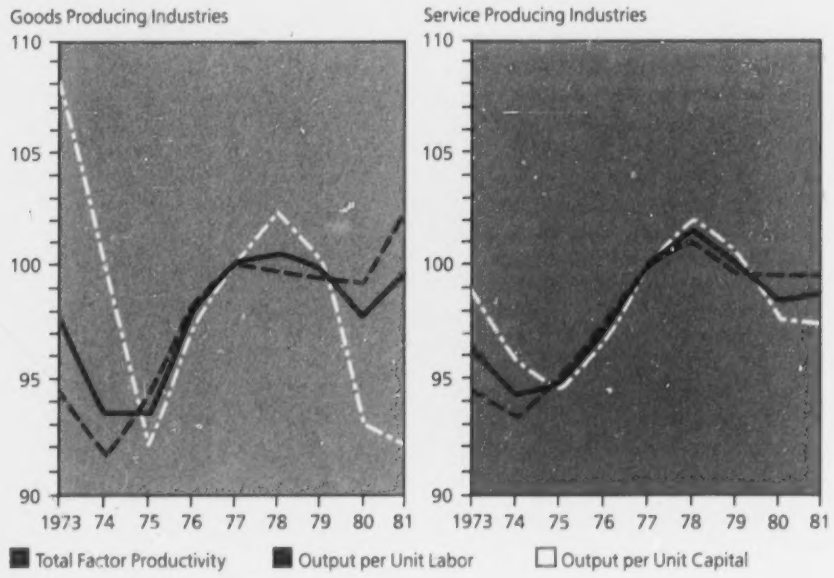
> "Business purchases of equipment in the high technology categories—computers, instruments, communication equipment, photographic equipment—accounted for 44 percent of all equipment purchases early this year (1982), up from only 25 precent in 1975 and 16 percent in 1965...the positive impact from using this equipment should contribute to the cyclical productivity rebound and partially offset the

Figure 7 Growth in national output, input and productivity, 1973-1981 (Average annual percent of change)

Segment	Output	Labor Input	Capital Input	Total Factor	Labor Productivity	Capital Productivity
Goods-producing industry						
1973-79	1.6	0.8	3.0	0.4	0.8	−1.3
1979-81	−0.8	−2.1	3.4	−0.1	1.3	−4.1
Services-generating industry						
1973-79	3.5	2.7	3.2	0.6	0.8	0.3
1979-81	1.4	1.4	3.9	−0.6	0.0	−1.4

Source: American Productivity Center

Figure 8 Changes in Labor, Capital and Total Factor Productivity 1973-1981



Source: American Productivity Center

deceleration in total capital stock available per worker, which is cited as a major cause of the slowing productivity growth trend."

The American Productivity Center's multiple-input productivity data series, tracking total factor, labor and capital productivity for major segments of the U.S. business economy, reveals some facts not apparent from single-input series. Analysis of the trends for the goods-producing industries shows a significant difference in growth rates for output and inputs from the trends in the services-generating industries. (Figure 7.)

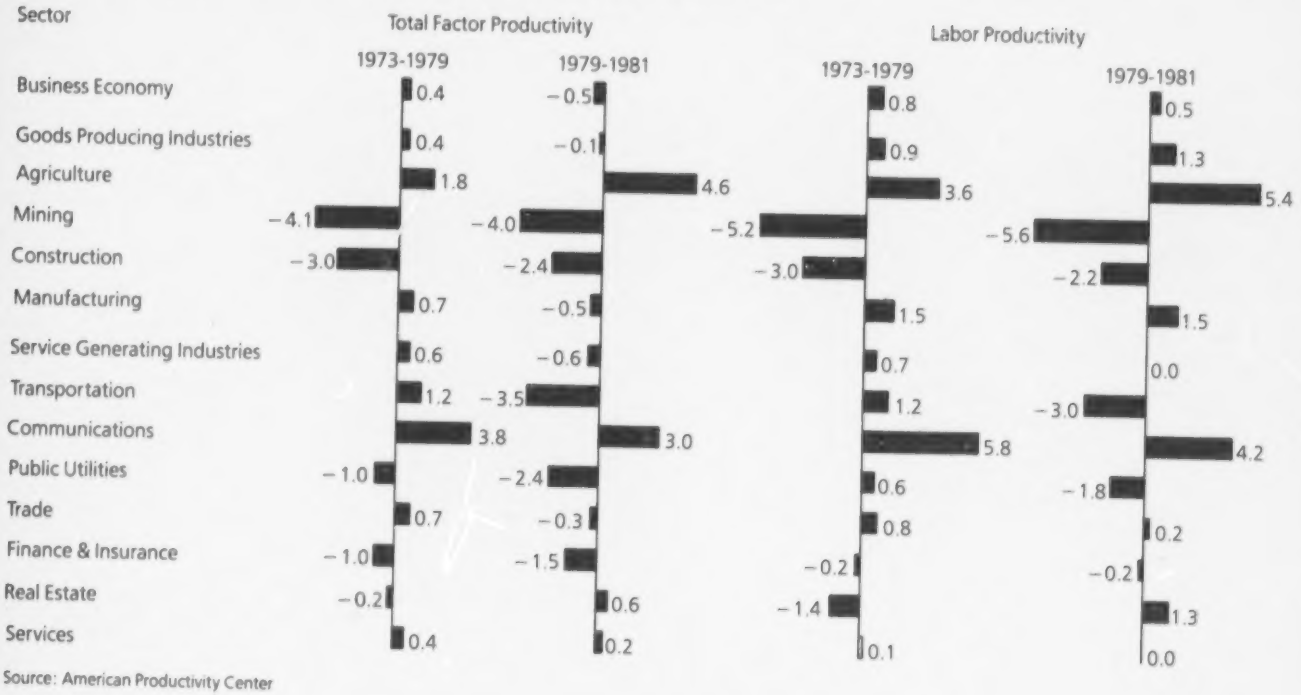
It is worth noting that the growth of real output for the services industries was significantly stronger in both periods than that for the goods industries. Obviously, the recessionary impact was altogether different for the two segments of the economy. Relatively poor capital productivity for the goods segment was due to the under-utilization of capacity of plant and equipment—which tends to be less flexible than "capacity" of many of the services industries. (Figure 8.)

These trends for the U.S. business economy and for the goods-producing and services-generating segments are a combination of diverse growth patterns for the individual sectors within each category. Figure 9 reflects the extremely varied pattern of individual sector growth rates.

In addition to the extreme diversity, other trends are worth noting:

- Except in mining and construction, modest productivity growth rates characterized the 1973-79 span. The sectors registering declines in both total factor and labor productivity were both few in number and small in magnitude of the decline.
- Given the dominant recessionary pattern, total factor productivity declines were the rule during 1979-81, with only agriculture and communications sectors registering significant gains. There were many sectors recording gains in labor productivity, but all were extremely modest except (again) agriculture and communications.
- In general, gains were more substantial and declines more modest for labor productivity than for the total factor series. This is normal because: 1) capital input is much less susceptible to adjustment with the business cycle than is the labor input and 2) industrial managers are trained to invest capital to improve profitability, total productivity and labor pro-

Figure 9 Growth Rates in Total Factor and Labor Productivity by Sector for Selected Years



Source: American Productivity Center

ductivity. In a sense, any gain in "capital productivity" *per se* is purely incidental. (This is not to say that managers do not attempt to make sure investments are sound and well conceived; these investments are *not*, however, specifically targeted to improve the relationship of capital input to gross output.)

The American Productivity Center's multiple-input productivity data services also provides information on *levels* of real (constant dollar) output per hour for the business economy and for the sectors and major industries. As can be noted in Figure 10 manufacturing, trade, and the business, professional and the other services sector, comprise the major portions of the business economy. The differences in share of hours versus share of output are, of course, due to the differences in levels of real output per hour (labor productivity). Relative levels of output per hour for the individual sectors of the economy, as expressed in constant 1972 dollar per hour, show startling differences, and the variances increased significantly between 1948 and 1981.

Figure 10 Share of output and hours attributed to the sectors of the U.S. business economy, 1948 and 1981

	Percentage				Level of Real Output/Hr (In constant 1972 $)	
	Share of Output		Share of Hours			
Sector	1948	1981	1948	1981	1948	1981
Business Economy	100%	100%	100%	100%	$3.48	$7.59
Goods Industries:						
Farming	5.9	3.2	18.3	5.7	1.12	5.63
Manufacturing	30.4	30.7	28.9	27.6	3.64	8.45
Mining	2.8	1.9	1.8	1.7	5.32	8.43
Construction	6.6	4.4	5.1	6.6	4.48	5.15
Services Industries:						
Transportation	7.6	4.3	6.5	4.3	4.10	7.61
Communications	1.4	4.8	1.6	1.8	3.11	23.24
Public Utilities	1.5	3.0	1.1	1.2	4.50	18.99
Trade	19.5	21.4	22.9	25.2	2.96	6.44
Finance & Insurance	4.4	5.6	2.73	5.5	5.60	6.44
Real Estate[1]	6.4	5.8	1	1	1	1
Services	13.3	14.8	10.0	20.2	4.63	5.55

[1]The BLS estimate of hours paid for this sector excludes commissioned sales persons; hence human resources input is understated, and "share of hours" and "output per hour" levels would not be accurate if computed.

Source: American Productivity Center

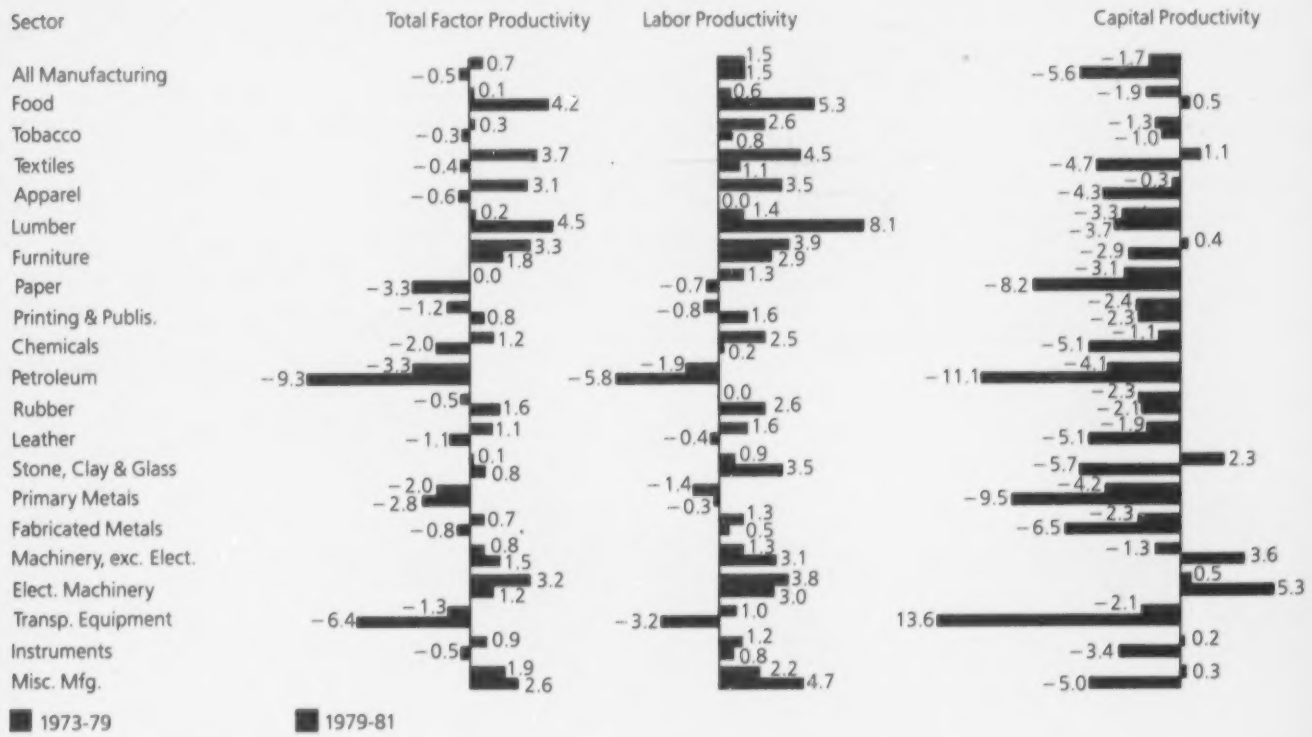
Data on total factor, labor and capital productivity trends for the 20 manufacturing industry groups are characterized by a diversity in dynamics similar to that noted for the major sectors of the economy. The spread between the highs and lows in growth rates of total factor and labor productivity is less dramatic among the groups within the manufacturing sector than among the several sectors in 1973-79 but greater in 1979-81. The patterns of dispersion of trends are summarized in Figure 11.

This summary reveals clearly a fundamental facet of multiple-input productivity trend patterns which is hidden in the more widely-known labor productivity partial measures: traditionally, it is assumed that increased input of capital is associated with productivity growth; however, even with sound management of the capital inputs, the data above suggest that trends in the relationship of capital input to the measured output tend to be negative or at best modestly positive. In periods of strong cyclical fluctuations and stress, as in 1979-81, capital pro-

Figure 11 Diversity in productivity trends

	Total number of industry groups			
	Positives	Negatives	High	Low
Total Factor Productivity				
1973-79	16	4	3.7%	– 3.3%
1979-81	9	11	4.5	– 9.3
Labor Productivity				
1973-79	17	3	4.5	– 1.9
1979-81	15	5	8.1	– 5.8
Capital Productivity				
1973-79	5	15	1.1	– 4.2
1979-81	1	19	0.5	– 13.6

Figure 12 Productivity Trends—Manufacturing Industry Groups 1973-1981



Source: American Productivity Center

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ductivity can be expected to perform very poorly, since the input of capital is relatively fixed. It is not susceptible to facile cutbacks in periods of declining demand and output. The same situation prevailed in the 1974-75 recession, but its effect is cloaked by the time-span covered (1973-79) in which the initial and the terminal year had relatively favorable levels of output and utilization of manufacturing capacity. (Figure 12.)

Data on levels of output per hour for the individual manufacturing industry groups provide a valuable supplement to growth-rate figures. (Figure 13.) For example, the growth leaders in productivity trend during the entire 1948-81 period were textiles, chemicals and electrical machinery. No other industries were close to this growth pace. The slowest growers were leather, printing and publishing, fabricated metals and non-electric machinery.

It should be pointed out that the shift in employment from a high-growth to a low-growth industry group will not automatically lead to a relative decline in productivity growth for all manufacturing. Similarly, from the workers' viewpoint, to seek employment in a high-growth industry will not always result in a higher wage rate.

The actual level of output per hour at a particular point in time, or the average level of output per hour over a span of years, is a more important determinant of average *productivity* levels in manufacturing industry and/or the industry's ability to pay a high wage than is the growth rate over a limited time span.

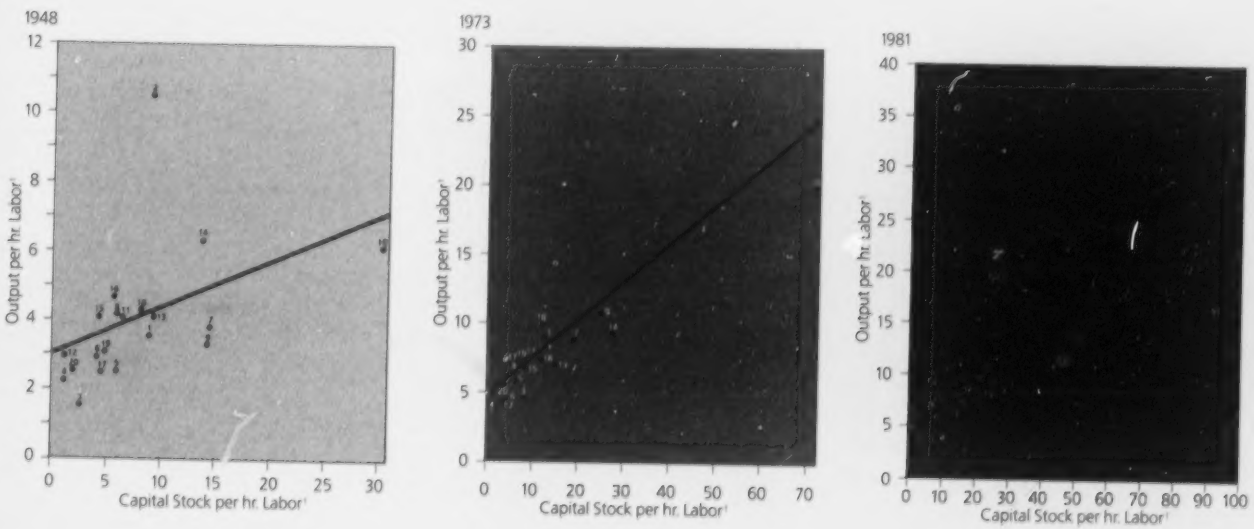
One of the primary determinants of levels of output per hour, in addition to effective management and sound management/labor relations, is the amount of capital which is applied to the production operation, and the relative age and condition of plant, machinery and equipment. The relationship of high levels of labor productivity and high levels of physical stock per hour is significant. (Figure 14.)

Figure 13 Growth of output per hour in selected industries: 1948-81

	Annual Percentage of Change, 1948-81	Level of O/Hour[1] 1948	1981
High-growth Industries			
Textiles	4.2%	$ 1.54	$ 6.18
Chemicals	4.1	3.35	12.44
Electrical machinery	4.0	2.48	9.04
Low-growth Industries			
Leather	1.4%	$ 2.98	$ 4.65
Printing & publishing	1.5	4.11	6.81
Fabricated metals	1.7	4.01	7.11
Machinery, except electrical	1.8	4.73	8.55
Modest growth—			
High O/Hour:			
Petroleum	2.9%	$ 6.19	$15.74
Tobacco	3.6	10.57	33.47
Transportation equipment	2.6	4.27	9.95
Food	3.2	3.51	9.85

[1]In constant 1972 dollars

Figure 14 Correlations of Output to Capital Stock in Manufacturing for Selected Years



1 Food
2 Tobacco
3 Textiles
4 Apparel
5 Lumber
6 Furniture
7 Paper
8 Printing, Publishing
9 Chemicals
10 Petroleum
11 Rubber
12 Leather
13 Stone, Clay & Glass
14 Primary Metals
15 Fabricated Metals
16 Machinery exc. Electrical
17 Electrical Machinery
18 Transportation Equipment
19 Instruments
20 Misc. Manufactures

[1]In real 1972 dollars.

Source: Department of Commerce

The International Picture in the Post-OPEC Years

The World Economy in the Early '80s

Consistent with the U.S. experience in the '70s, the free world's other industrial nations suffered severe economic disruptions following the 1973 OPEC oil embargo and price escalation. These nations began recovering slowly from the 1974-75 recession, achieving stability in growth of output, productivity and employment along with reduced inflation by 1978.

The oil price shock of 1979-80 triggered a new "double dip" worldwide recession in 1980 and 1981, which worsened in 1982, with no recovery anticipated before "sometime in 1983." Though the situation of the individual nations has varied significantly, all have suffered severe losses in output volume and exports, with rising unemployment accompanied by high inflation rates and interest rates far above past experience.

The cumulative tenfold increase in oil prices between 1974 and 1981 forced a massive transfer of wealth from the world's non-OPEC nations to the oil-producing countries. Efforts to pass the inflationary impact through the economies and still avoid rampant inflation and unemployment have not met with success.

Inflation was a severe but receding problem during 1980-82 in the United Kingdom, Italy, France, the United States and Canada. Particularly crippling was the rate of inflation in some of the minor industrialized and developing nations. Mexico, Brazil, Argentina and Turkey recorded almost unbelievable increases in inflation.

Unemployment took a particularly heavy toll in the United Kingdom, Belgium, Canada, Italy and the United States. According to the OECD mid-1982 economic analysis, actual unemployment rates are likely to be larger than the official statistics indicate. Uncounted in current statistics are the increasing numbers of unemployed who have become ineligible for unemployment benefits and the many others who have withdrawn from the job-seeking labor force out of disillusionment. In most nations scheduled work hours have been cut and holidays lengthened. In some countries, government-financed training efforts have been expanded to cushion unemployment.

World Productivity Dynamics in the Late '70s and Early '80s

Productivity growth gradually regained its strength in all the major industrial nations during 1974 to 1979. However, the second oil shock and renewed recession in 1980-81 disrupted normal patterns in domestic demand and established export markets.

New data compiled by Angus Maddison reveal particularly severe drops in labor productivity growth for Canada, the Netherlands, Belgium, Germany and France. All of these nations rely heavily on the export market for output growth maintenance and economic health. These markets have declined sharply during the worldwide recession of 1980-81. More modest, but still very damaging, declines in world trade occurred for Japan, the U.S. and Italy. Japan is as dependent on the export market as are the Western European nations but apparently coped with the economic problems better, just as she did during the 1974-75 recession. The United Kingdom stands quite apart from the other industrial nations. (Figure 15.)

The growth rates for real output, employment, average hours per person, unemployment and labor productivity provide some extremely interesting contrasts. The drop in labor productivity growth between 1973-79 and 1979-81 is compared in Figure 16.

Figure 15 shows that real output rose during both time spans in all nations (except the U.K., '79-'81, where there was a drop of 1.8 percent). Employment grew slightly in 1973-79 for all nations except Germany; and very slightly in 1979-81 for some nations. Hours worked per employee year declined in both periods for all nations except Canada and the U.K. The average rate of unemployment rose sharply in the second period of comparison in all nations except Japan. Even Germany, which has a national fear of inflation and unemployment, experienced a significant rise in unemployment in 1980-82—up to a rate of 10 percent.

Given international economic conditions, most of the industrial world has followed a fairly predictable productivity pattern in

Figure 15 Growth rates in real product, employment hours and productivity in key industrial nations for selected years

	Average Annual Growth Rates									
	Real Output[1]		Employment		Hours per Person		Real Output per Hour[2]		Average Rate of Unemployment	
Country	1973-1979	1979-1981	1973-1979	1979-1981	1973-1979	1979-1981	1973-1979	1979-1981	1973-1979	1980-1982
United States	2.7%	0.9%	2.4%	0.6%	−0.8%	−0.4%	1.4%	1.0%	6.4%	8.0%
Canada	3.3	1.4	2.4	0.8	1.4	−1.5	1.0	−0.8	6.9	8.3
Japan	3.7	3.6	0.7	0.9	−0.5	−0.2	3.9	2.7	1.8	2.2
U.K.	1.3	−1.8	0.0	−3.6	1.0	−2.9	2.1	3.7	3.6	10.2
France	3.1	0.7	0.2	−0.4	−0.9	−0.8	3.5	2.2	4.2	7.4
Germany	2.4	0.8	−0.7	−0.2	−1.0	−1.3	4.2	2.0	2.9	4.6
Belgium	2.5	0.5	0.0	−0.1	−1.8	−0.5	4.2	2.1	4.2	10.8
Netherlands	2.4	0.7	0.6	0.7	−1.4	−0.2	3.3	0.3	3.7	7.1
Italy	4.0	1.8	0.5	0.6	−2.3	−0.5	2.5	1.6	6.5	8.4

[1]Real gross domestic product, with 1975 U.S. price and exchange rates, adjusted for purchasing power parities.
[2]Real GDP per hour worked.
Source: Angus Maddison, "Comparative Analysis of the Productivity Situation in the Advanced Capitalist Countries," Bureau of Labor Statistics, unpublished data. OECD, "Economic Outlook," July 1982 Goldman Sachs Economics.

recent years. One exception emerges from this assemblage of data—the United Kingdom. Employment, which on the average held steady through the 1973-79 span, dropped sharply (3.6 percent per year) in 1979-81; average hours worked per person per year dropped 2.9 percent.

As a direct result of the 1.8 percent drop in real national product and the cuts in both employment and hours per employee, unemployment rose to 10.2 percent in 1980-82, held at 12.5 percent of the labor force in the latter half of 1982, and is expected to stay over 12 percent during 1983.

This severe slash in U.K.'s labor input has caused the surprising 3.7 percent per year *increase* rate in labor productivity for the 1979-81 span. No other major industrial nation is near that rate except Japan—where unemployment has been held to 2.2 percent average.

If BLS preliminary estimates of labor productivity growth for the third quarter hold up, it appears possible that a somewhat comparable situation has emerged in the second half of 1982 in the United States. As unemployment climbed to 10.8 percent (involving over 11.5 million persons), output per hour for the U.S. business economy rose 4.0 percent, with an accompanying decline of 2.5 percent in aggregate hours input.

Productivity Dynamics for Major Segments of Economies

Analysts of international economies have long known that there are major differences in both productivity levels and trends for individual sectors and industries, but specific data comparing the nations in this fashion have been lacking. Now, two new studies completed during 1982 are beginning to fill this productivity information gap. Studies on labor productivity by the Japan Productivity Center and on multiple-input productivity by the American Productivity Center have generated a significant amount of useful new information.

Output per Employee[1] Levels and Trends for Major Sectors: Eight Nations[2]

Absolute levels of labor productivity[3] in the United States were substantially above all other industrial nations in 1970, for all sectors. (Figure 17.) The U.S. retained unchallenged labor productivity leadership through 1979 in agriculture; the transportation, storage and communications industrial composite; and business, professional and other services, though the size of this advantage was eroded in comparison to Germany, France and Belgium. The U.S. also retained her traditional productivity leadership in the important manufacturing sector in 1979, but the advantage was cut very sharply, by Belgium, Japan and France.

By 1979, other nations had assumed the world's productivity leadership in mining, public utilities and construction, according to the JPC's output per employee calculations. Japan was the leader in mining, with a level at 114 percent that of the U.S. In public utilities, Belgium (172 percent), Germany (134 percent) and France (111 percent) became the current world productivity leaders, with the U.S. in fourth place. For the construction sector, Germany (117 percent) and Belgium (111 percent) led the world in productivity.

The JPC series presented useful new information on productivity levels and trends in two of the increasingly important East Asian nations—Korea and Singapore. While their growth rates were strong, their absolute levels of output per employee in 1979 were still generally far below those of the Western industrial powers and Japan. Singapore did, however, approach the levels of the U.K. for several sectors, and in mining exceeded the levels of Germany, France, Belgium and the U.K., with an output per employee rate 59 percent that of the U.S.

Growth rates for the United States were the lowest or among the lowest in all major sectors included in the JPC analysis, with the U.K. generally a strong contender for that dubious honor. Exceptions were in transportation, storage and communications; agri-

Figure 16 Decline in productivity growth rate

Nation	(1979-81 vs 1973-79)
Netherlands	−3.0
Germany	−2.2
Belgium	−2.1
Canada	−1.8
France	−1.3
Japan	−1.2
Italy	−0.9
United States	−0.4
United Kingdom	+1.6

Source: Bureau of Labor Statistics

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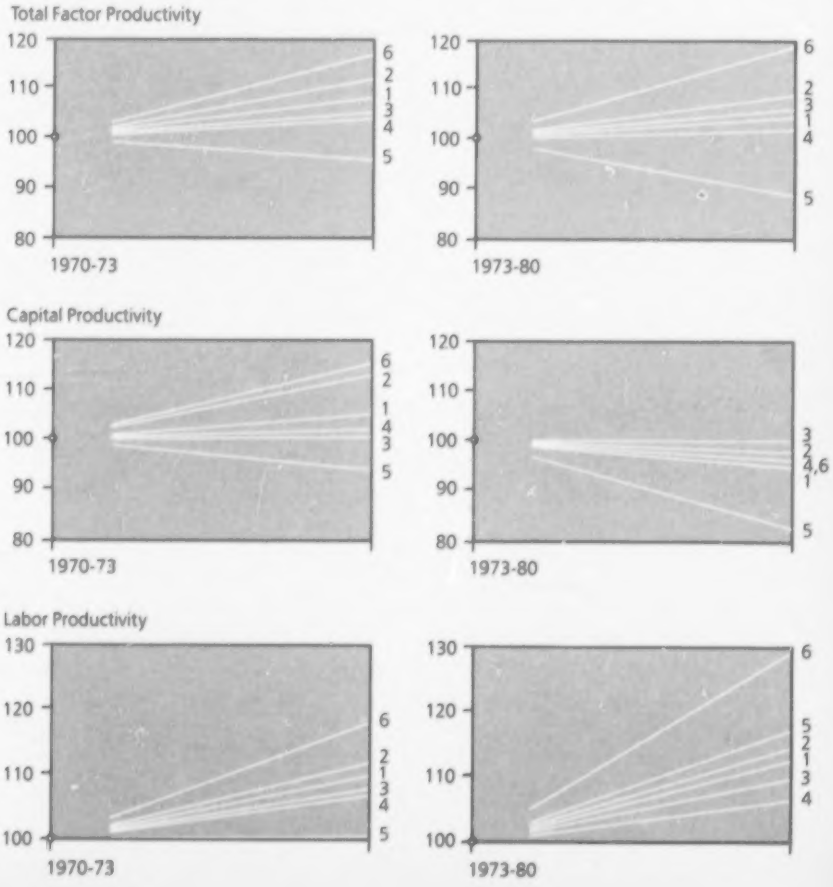
Figure 17 Levels and trends in real output per employee for selected nations by sector

Country	Natl. Economy	Agri.	Mfg.	Mining	Constr.	Utili	Comm. & Trans.	Services
Trends[1] (1973 = 100)								
U.S.A.	101	114	107	74	90	97	114	99
Japan	119	110	145	111	94	131	114	110
Germany[2]	118	126	116	91	118	126	125	115
France	118	128	127	118	105	131	121	110
U.K.[2]	105	116	104	222	99	111	108	102
Belgium	115	115	136	109	108	151	103	105
Singapore[2]	116	130	96	140	123	152	140	114
Korea[2]	132	132	129	62	93	206	120	107
Levels—1979[1] (U.S. = 100)								
U.S.A.	100	100	100	100	100	100	100	100
Japan	63.7	24.3	93.2	114.0	73.9	94.0	46.8	65.0
Germany[2]	85.0	39.2	85.4	25.2	117.3	134.2	71.8	90.6
France	90.0	53.8	90.0	42.5	89.7	100.6	62.6	88.2
U.K.[2]	58.0	60.2	52.8	58.4	77.0	58.1	55.1	54.9
Belgium	90.8	85.7	96.9	33.1	111.3	172.3	78.8	80.6
Singapore[2]	39.6	36.6	36.9	58.9	59.3	40.0	39.7	38.2
Korea[2]	12.5	6.5	19.3	13.2	16.6	38.9	19.1	14.4

[1]Output expressed in basic data in terms of 1973 exchange rates.
[2]Data for these countries is from 1978.
Source: Japan Productivity Center

Figure 18 Trends in Total Factor, Labor and Capital Productivity for Japan/U.S.



1. Private Business
2. Goods Producing Industry
3. Service Generating Industry
4. Non-Farm, non-Manufacturing Industry
5. Agriculture
6. Manufacturing

culture; and manufacturing where the U.S. was only *near* the bottom in productivity growth rates. (Figure 17.)

Multiple Input Productivity Levels and Trends: U.S. and Japan[4]

This comparison provides a new in-depth perspective on productivity levels and trends for major segments of the two economies. Coverage is provided for private business, the aggregates for goods and services producing segments, for 10 sectoral groupings and 10 manufacturing industry groups.

Trends in total factor, labor and capital productivity are presented in Figure 18 for the major segments of the business economies for 1970-73 and 1973-80. Levels of output per hour, expressed in constant 1975 U.S. dollars, are presented for these major segments in Figure 19.

Trends in total factor productivity for important manufacturing industries for four key periods in the 1970s are shown in Figure 20. Data on levels of real output per hour, in manufacturing, 1970 and 1980, appear in Figure 21.

In general, the story of productivity during the 1980s for the two nations is dominated by a growth rate advantage for Japan in all sub-periods, most particularly in labor performance. In some groupings, Japan did not do as well in capital productivity. The rates for total factor productivity, which reflects the weighted average of the inputs of capital and labor, are in all instances lower than those for labor productivity.

The pattern of both total factor and labor productivity is one of extreme divergency in direction and amount of productivity change, and in the *absolute levels* of labor productivity at any given point of time. In general, the size of the divergence in both levels and trends among the several sectors and industries is significantly greater in Japan than in the United States, due to a combination of environmental, cultural and governmental/organizational factors. For example, productivity levels in agriculture are far lower in Japan than in the U.S., due in part to the nature of Japan's topography and in part to the tradition of small shareholdings coupled with an antipathy to large corporate-owned farming. Trade—especially retail trade—is far below U.S. levels of productivity in Japan, due to a traditional preference for very small, specialized shops and relatively few large department stores.

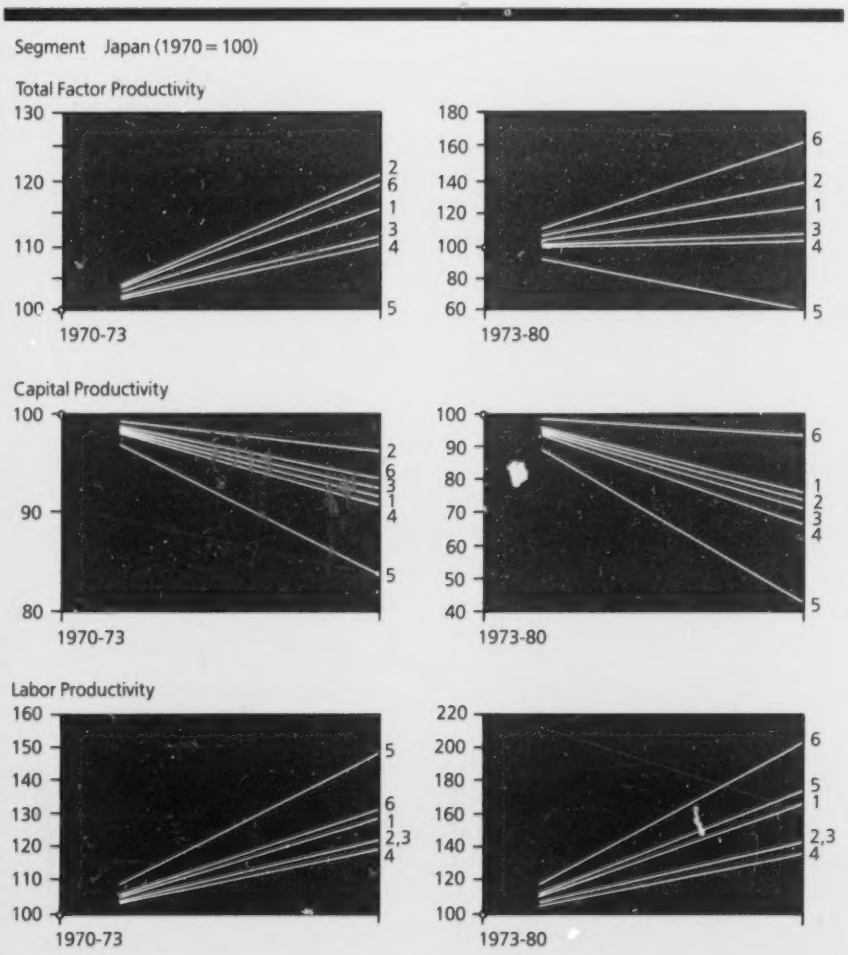
In contrast, Japanese manufacturing has led the world in productivity growth for 30 years, and the average level for the manufacturing sector now approaches that of the U.S. Further, in a number of key industries, Japan had by 1980 far surpassed the U.S. absolute level of productivity (whether expressed in 1970, 1973, or 1975 constant dollars, and whether expressed with U.S., own-country or international price weights).

A factor contributing to the wide spread in growth rates among different Japanese manufacturing industries is that nation's focus on improving competitive capability, efficiency and "striking power" in the export market for targeted industries. Likely as a result of this strategy, the Japanese advantage has grown especially large for primary metals, chemicals, electrical machinery and (reportedly) for precision instruments. Japan also leads the world in labor productivity in the mining sector.

The dispersion in both trends and levels of productivity between manufacturing industries in Japan is far greater than in the United States. There was a more than sevenfold difference in 1980 output per hour between the Japanese primary metals industry group and textiles. (Expresssed in U.S. dollars the difference was $21.43 versus $2.93.) The widest spread for U.S. manufacturing was only $14.91 for chemicals versus $7.10 for textiles.

In the sector analysis, the U.S. range in levels of output per hour in 1980 was from $6.70 for the "business, professional and other services" group up to $25.37 for utilities. For Japan, the spread was from $19.74 for utilities down to only $2.38 for agriculture, a difference of over eight to one.

Figure 22 highlights the productivity trend variations within each nation.



1. Private Business
2. Goods Producing Industry
3. Service Generating Industry
4. Non-Farm, non-Manufacturing Industry
5. Agriculture
6 Manufacturing

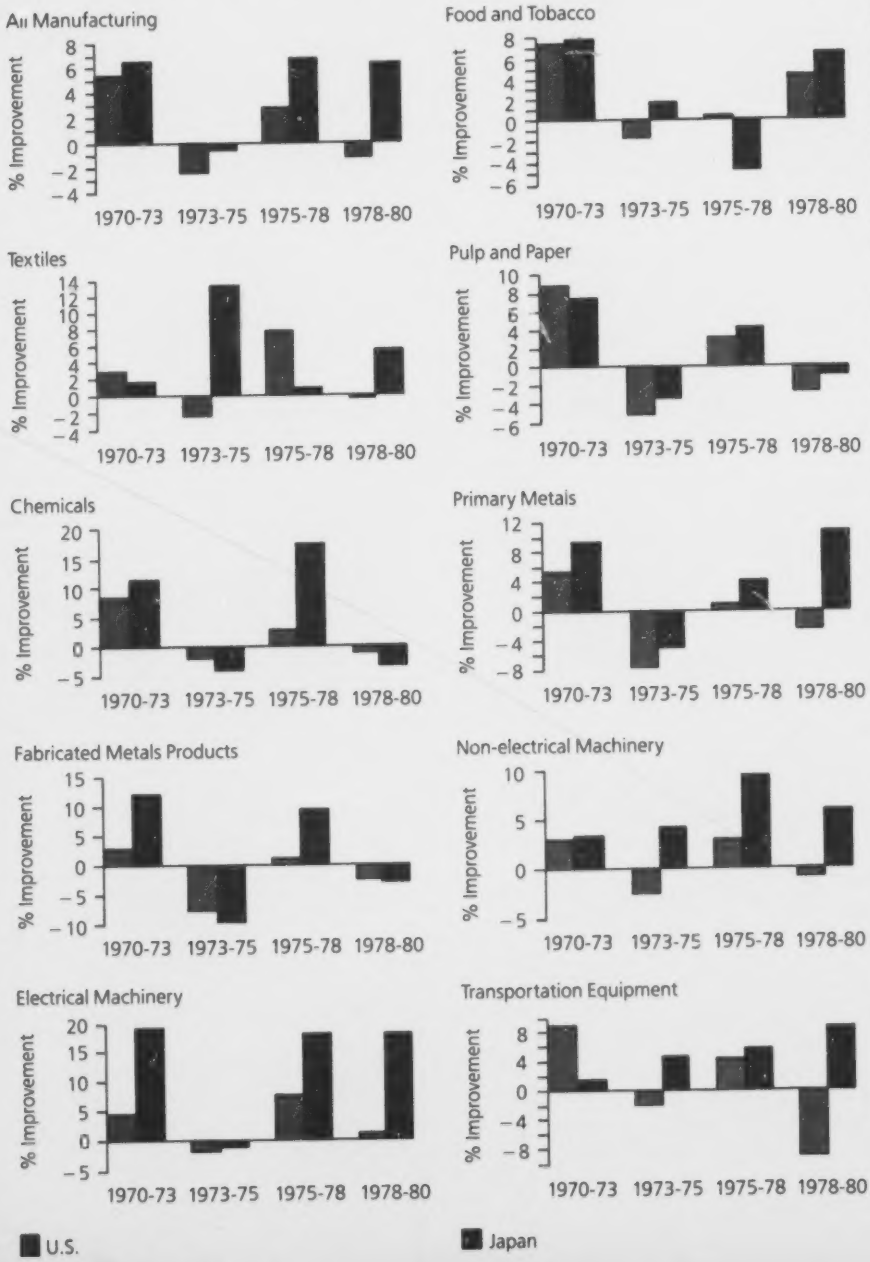
Source: American Productivity Center

Figure 19 Comparative levels of labor productivity: U.S. vs. Japan

	Estimated Real Output per Hour[1], in			
	1970		1980	
Segment	U.S.	Japan	U.S.	Japan
Business Economy	8.27	3.59	9.27	9.01
Goods-producing industry	8.37	3.14	9.68	5.99
Services-generating	8.16	4.20	8.98	6.03
Non farm, non-manufacturing	8.64	4.15	9.07	5.68
Agriculture	6.17	1.37	7.21	2.38
Manufacturing	7.92	3.91	10.17	8.00

Source: American Productivity Center

Figure 20 Productivity Growth for U.S./Japan by Manufacturing Industry



Source: American Productivity Center

Outlook

The Near-Term Economic Setting: Summary and Probabilities

As most observers of the international economic scene have emphasized, the problems currently afflicting the industrial nations have piled up over a period of more than two decades and cannot be reversed quickly. During the "golden era of productivity" (1950 through the mid-'60s) prosperity came to be accepted as the normal state of affairs and was taken for granted. The leaders of many nations, especially in Western Europe, shifted focus away from actions that could that could improve output and productivity toward actions that could encourage a better "quality of life," reduce economic insecurity, and modestly redistribute the fruits of past increases in national output and productivity. These actions, in due course, led to larger government expenditures and a built-in inflationtary bias. In the process, these policies reduced operating flexibility, profits and productivity growth in the private sector.

Much of the same type of reformulation of national policy and goals took place in the United States beginning with the Johnson Administration's "guns and butter" philosophy. Of even more importance in the U.S. was the tendency to assume that this nation was—and always would be—the leader in science, technology, management skills, output and international trade. This conviction slowed the national drive to improve productivity and output growth. We are now "harvesting the fruits of our neglect."

The immediate outlook for the world's industrialized countries is generally weak.

Estimates for 1983 (Figure 23) indicate that only Japan can expect real GNP to rise four percent; and Germany, 3.25 percent. Growth for all other nations is expected to be lower, ranging down to one percent for Canada and even lower for the Netherlands. The hope for any 1983 reduction in unemployment is thus grim indeed. Unemployment remains high in the U.S., Britain, Italy, Canada and the low countries. Output, utilization of the nations' industrial facilities and the volume of international trade remain far below the levels achieved two or three years ago.

There are certain basic requirements for a significant economic turnaround and strong future economic growth. Basic to lasting economic recovery are four pre-conditions:

- For a strong free-world economy and a full recovery of past international trade volume and patterns, a strong U.S. economic recovery is a prerequisite. This

remains a necessity because of the sheer size of the U.S. market and its continued domination of world trade and financial patterns, despite setbacks in both areas during the '70s.

- Observers of international economics in Canada, Western Europe and Japan are unanimous in their conviction that the unprecedently high U.S. interest rates during the years 1979-82 have been responsible to a considerable degree for their own current economic problems. Recent drops in both long and short-term U.S. interest rates are being watched throughout the industrial world and may signal improving conditions.
- Recovery and economic stability in the '80s, will require continuing success in energy conservation and avoidance of large oil price escalations. Though some nations are working vigorously on economical energy alternatives to imported petroleum, the U.S is unfortunately not now among them.
- A new factor in 1982 which threatens economic stability later in the '80s if not satisfactorily handled is the severe pressures on the international financial system. The tremendous national debts of Mexico, Brazil and Argentina and the possibility of default threaten the collapse of the already brittle international financial system.

Economic Growth and Productivity Improvement

There is a very direct relationship between these economic problems and the rate of productivity growth in each of the industrial nations. Productivity is both a contributor to and is affected by changes in industrial output and capacity utilization, inflation and interest rates, and employment and unemployment.

United States

Two scenarios might be traced for the U.S. economy in the coming years. Under the "dismal alternative," interest rates would remain stubbornly high discouraging big ticket consumer expenditures. Capacity utilization and output would hold at current depressed levels, lacking any growth stimulant. With incentive lacking, the pace of industrial investment for factory modernization and expansion would remain limited and the unemployment rate high. With no increase in output, the potential improvement in productivity would have to come from squeezing out excess labor and related costs.

A second, more hopeful scenario can be postulated which holds that the recent

Figure 21 Comparative levels of labor productivity for selected industries, U.S. vs. Japan

	Estimated Real Output per hour[1], in			
	1970		1980	
Segment	U.S.	Japan	U.S.	Japan
Primary Metals	11.51	8.61	12.01	21.43
Chemicals	10.26	6.54	14.91	17.77
Electrical Machinery	6.90	2.78	10.22	13.32
Fabricated Metals	8.53	3.32	10.05	4.75
Non-elec. Machinery	8.54	4.03	10.04	7.98
Transportation Equipment	8.47	5.19	10.90	10.30
Pulp & Paper	8.28	5.11	11.16	9.20
Textiles	5.11	1.58	7.10	2.93
Food & Tobacco	9.51	3.81	13.35	7.07

[1]In constant 1975 U.S. $ (yen converted at 1975 U.S. price/exchange rates, adjusted to purchasing power parity).
Source: American Productivity Center

Figure 22 Labor, capital and total factor trend variations among sectors, U.S. and Japan, 1970-80

	Average annual productivity growth rates, 1970-80:			
	U.S.		Japan	
Category	Rate (%/yr)	Sector	Rate (%/yr)	Sector
High:				
Total Factor	2.8	Trans. & Comm.	4.6	Mining
Labor	3.5	Trans. & Comm.	8.7	Mining
Capital	1.2	Trans. & Comm.	1.6	Finance/ Insurance
Low:				
Total Factor	−2.5	Mining	−5.0	Agriculture
Labor	−3.5	Mining	0.7	Construction
Capital	−1.9	Construction	−8.6	Bus, Prof Services

Figure 23 Rates of growth in real GNP and inflation

	Real GNP Growth		Unemployment		Growth rate of Consumer Prices	
Country	1982	1983	1982	1983	1982	1983
United States[1]	−1.5	2.25	9.5	10.0	6.0	5.9
Japan	2.0	4.0	2.25	2.25	3.0	3.0
Germany	1.0	3.25	6.5	7.0	4.8	4.0
France	2.25	2.5	8.25	8.5	14.5	13.0
United Kingdom	1.25	1.75	12.0	12.25	10.0	9.0
Italy	1.5	2.5	9.5	10.0	17.5	16.5
Canada	−1.75	1.0	10.0	10.0	10.0	9.0
Belgium	0.5	2.0	12.5	N.A.	8.4	N.A.
Netherlands	0.0	0.5	9.0	N.A.	6.6	N.A.

[1]Mid-year estimates by U.S. economists on real GNP growth in 1982 ranged from a high of −1.1 percent to a low of −2.0 percent. Our estimate, based on just-published third quarter figures plus fourth quarter estimates indicates a decline of 1 percent in real GNP for the U.S. in 1982. For 1983, however, the average of eight U.S. forecasters is for a stronger performance, at 3.4 percent for the year. (All forecasters anticipated a real GNP growth in 1983 of between 3.0 and 3.9 percent.) For unemployment, data through October indicate an average for the year of 9.5 percent of the civilian labor force; and perhaps even higher in 1983. Hence, the U.S. observers' 1983 estimates appear in line with the OECD estimate of 10.0 percent.
Basic data: "OECD Economic Outlook," July 1982
"Statistical Bulletin," Vol. 15, No. 9, September 1982, the Conference Board
Source: The American Productivity Center

decline in interest rates will continue. Fears that an upturn in demand and output might refuel inflation will not be realized. Pent-up consumer demand will be translated in due course into significant increases in purchases of both durable and nondurable goods. As this trend takes shape, unemployment will rapidly decline, as industry steps up utilization of existing plant to meet rising demand. As demand expands, the recovery will appear assured and profits will rise. Industry will carry out a sizeable program of introducing new machinery and equipment embodying new technology. Focus on the development and expansion of both domestic and international marketing of new and high technology products will increase. In this scenario, the growth rate for productivity would be strong and rapid, perhaps in time equalling the rates achieved during the 1950s and early 1960s.

There are several entirely new elements in the U.S. picture under this second scenario which fuel optimistic productivity growth assumptions:

- The complacency which plagued the U.S. industrial community as well as the government during most of the post war period has been significantly shaken. Action to strengthen the economy and to improve productivity is already underway—and should increase.
- There appears to be a new readiness for U.S. management, labor and government to exchange views and work together for productivity/wage/profitability improvement.
- There is good evidence that significant new technological development in robotics, production planning and control will improve productivity at the factory level.
- New developments in information/communications technology appear capable of revolutionizing many aspects of administrative, white collar and knowledge worker activities, which should lead to significant productivity growth in this area—affecting both manufacturing and most of the service industry sectors. This should help solve the persistent problem of low productivity growth in the "white collar" and "service industry" areas.
- The dilution of the average skill and experience of the U.S. labor force in the late '60s and in the '70s, due to the unprecedented rate of entry of women and younger men, will not continue. The average level of experience and capability of the U.S. worker will be substantially higher in the '80s than in the '70s. The occupational mix will move to an increasingly higher proportion of professionals and skilled technologists to handle increased automation and computer-aided production operations. This should foster increases in both absolute levels and growth rates of U.S. labor productivity.
- It appears likely that the U.S. leadership in information/communications technology and in software requisite to expanding automation in the office and service industry of the future should directly augment employment and national product output related to this sector.
- In due course, though the transition is likely to prove painful, antiquated, industrial facilities in many U.S. basic industries will be phased out and replaced with newer facilities involving more advanced technology. This should lead directly to higher absolute levels of productivity, higher wages for the more skilled work force, increased international competitive capability, larger output volume and higher profits.

Japan

Japan will continue to rank as the world leader in coping with the mass of economic problems afflicting the industrial world, but there are elements in Japan's outlook working against a continuation of her economic growth and productivity increases at a pace even approaching that of the past.

- Japan has a major structural problem in the tremendous government fiscal deficit (over five percent of GNP) which it has not been able to reduce. The government's efforts to cut costs in the state enterprises, including the nationalized railway system, National Telegraph and Telephone Public Corporation and the Japan Tobacco and Salt Public Corporation have not met with success. Similar efforts to improve productivity and reduce government subsidies for the politically potent but inefficient agricultural sector have also been frustrated.
- Much of Japanese industry had by the 1980s matured to the point that the extremely-rapid output and productvity growth rates experienced in earlier years could not be expected to continue.
- Japan's domestic market is small, especially in light of its peoples' propensity to save rather than to spend.
- Government leaders have had little success in their recent efforts to increase domestic demand to compensate for losses in export markets.
- There is ample evidence of growing resistance in the United States and European countries to past rapid Japanese inroads in their domestic markets for both producer and consumer goods.
- Production of both basic materials and finished products is increasing in many of the world's developing nations. Hence, it is likely that their own products will in part displace imports from Japan, which grew so rapidly during the 1970s.
- During the first three decades of her post-World War II growth, Japan depended primarily on outside sources for her science and technology and adapted imported knowledge and technique to her own requirements. Now, however, Japan has reached many frontiers of science and technology and thus is forced to begin to share the world's basic research burden. This will not yield results in the form of increased output and higher productivity as rapidly as did the adaptation of the results of such work by other nations.

Germany

Like other Western European nations, Germany depends upon the export market for a major portion of her total production. During 1980, with the recession and collapse of international demand, her real GNP increased less than two percent and in 1981 actually declined slightly. Estimates for 1982 reflect the beginnings of recovery, but with a real output growth of only about one percent—far below the level required to hold down unemployment.

Germany, like all the industrial nations, has had significant problems in adapting to the second oil shock and in attempting to pass the oil price escalation through the economy without a large rise in inflation. Despite strong domestic wage restraint—not successfully accomplished in some other European nations—consumer prices rose distressingly; and monetary action to combat inflation forced a sharp rise in interest rates. The domestic pressure was aggravated further by the inordinately high U.S. interest rates, which tended to drain needed capital away from the domestic capital market.

Perhaps more sharply than other European nations, Germany was also affected by both economic and socio-political stresses from developments in her Communist-block neighbors. (Germany has particularly heavy financial investment in Poland.) These factors were aggravated by strong citizen dissatisfaction with high unemployment and inflation. The political stress resulted, finally,

in a change in political leadership in the fall of 1982.

Significant recovery, however, is signaled for 1983, with a rise in real GNP of three or four percent, driven largely by significant increases anticipated in the export market, perhaps ranging up to eight percent above the 1982 level. Employment, however, is not expected to rise significantly due to anticipated sharp improvements in labor productivity as industrial capacity utilization rises.

France

France has suffered from the impact of the second OPEC shock, perhaps more than Germany though relatively less than Italy, Belgium and the Netherlands. As recession took hold of the industrial world, France experienced unprecedented unemployment, coupled with extremely high inflation, rivaled only during its 1974-75 recession. French real GNP rose only about one percent in 1980; and was virtually flat in 1981. However, due to a significant increase in the second half, real GNP in 1982 should rise over two percent and probably over 2.5 percent in 1983.

France, like Germany, Belgium, Italy and other European nations, has experienced severe political problems in the past few years, which culminated in the accession to power of a socialist government. The policy of the new government, with expanded transfer payments and some federal pump-priming for employment, achieved increases in consumption in 1981. However, this policy also gave rise to further increases in inflation and government budget deficits, and caused the erosion of private business profits.

The mixed economic pattern of 1982 is expected to continue into 1983, though some increases in export markets and in total output are anticipated.

Like Germany and the U.K., France can anticipate a meaningful increase in labor productivity. However, this rise in itself will tend to hold down expansion of employment until 1984 or even later.

Canada

The Canadian economy is in very serious trouble. Real GNP showed no growth in 1980, rose only three percent in 1981, and now appears to have declined nearly two percent in 1982—by far the worst growth performance of all the major industrial nations. This growth decline, which began in mid-year 1981, was influenced in part by the second dip of the U.S. 1980-81 recession, since the economies are closely interrelated. However, purely domestic problems probably exerted a larger influence.

Canadian government policies played a significant role in worsening the situation. New policies discouraging foreign investment have encouraged U.S. and other nations' corporate investors to withdraw from in Canadian industry. The new energy policy, introduced in October 1980, led directly to a significant temporary disruption of Canadian output of oil and other energy resources. Pre-cutback levels have not yet been achieved again, though a settlement of the main conflict between Alberta and the central government was reached in September 1981. Monetary policies aimed at controlling inflation and the outflow of capital succeeded mainly in further escalating interest rates.

Unit labor costs have escalated due to extremely poor rates of productivity and an unwillingness on the part of labor to consider reductions in built-in wage rate escalation, which the OECD estimates has increased the wage bill 11 or 12 percent in 1982. The productivity performance for Canada has consistently been the worst of all the industial nations since 1973, with a growing rate in real GDP per hour worked of only one percent per year during 1973-79, a *decline* in 1979-81 of 0.8 percent per year (the *only* nation recording a decline in this period), and estimated additional declines for 1982-84.

Prospects for an early resumption of sustained growth are not at all promising. As 1982 came to a close, inflation fell to a single-digit pace and real GNP rose slightly. However, unemployment continued to rise with further losses expected in 1983.

Canadian governmental policy will not be supportive to growth. Recent deterioration in Canadian competitiveness in the international marketplace because of low productivity and rising unit labor costs will likely work against significant increases in exports. The same influences appear certain to fuel inflation, high interest rates and increases in unemployment. With these increases, and the pervading consumer pessimism about the future, there is little reason to project any rise in domestic demand.

United Kingdom

To the economic observer, the U.K. offers a depressing picture, which is not brightened significantly by a modest increase in labor productivity in 1980 followed by a sharp rise in output per hour in both 1981 and 1982. Productivity gains traceable to declines in both employment and hours worked per person coupled with declines or only slight gains in real output are not considered a signal of national economic well-

being, especially by the nation's labor leaders.

Nevertheless, the U.K., which over the years has shared with the U.S. and Canada the distinction of competing for the *lowest labor* productivity growth rate among the major nations now has withdrawn from that race, at least for a period of time.

The low countries

Belgium and the Netherlands, which were among the world's productivity leaders until the 1980-82 double-dip recession, have fallen on extremely hard times. Lacking much of a domestic market, these nations require continuing export growth to support gains in real GNP, employment, productivity and profits. Their export market completely collapsed in 1980-82. Real GNP showed a decline in 1981 and virtually no growth in 1982. Some improvement is anticipated in 1983, with the recovery of both European and overseas markets. Unemployment rose to disastrous levels, especially in Belgium, which rivaled the U.K. for the highest rate (over 12 percent of the labor force) in 1982.

There have been severe internal stresses and turmoil in these nations, especially in Belgium, which has witnessed regional discord approaching outright conflict. The public sector deficit in Belgium reached the equivalent of 13 percent of GNP in 1981, one of the highest of any OECD country, reflecting the slowdown in growth and the rise in unemployment and the attendant transfer payments in an economy which provides extensive social welfare coverage.

As in the U.K., some gain in labor productivity—especially in manufacturing and energy production—was achieved at the expense of cuts in employment and in average hours per employee, even with essentially flat real output.

The near-term prospects for economic growth and productivity improvement are not bright—interest rates remain high, demand is sluggish and with the very high levels of real interest the prospect of low capacity utilization persists. This is despite new measures the government introduced in 1982 to prevent Belgium from sinking deeper into a slow growth trap. There is little reason to anticipate improvement in the productivity growth rate of 1980-82 to levels approaching those of the past.

Italy

Historically, economic experiences and patterns in Italy have been at wide variance with other major European nations. She has experienced substantial variations in domestic demand and in international export patterns. She appears to be afflicted with more continuous political instability. She has consistently recorded higher rates of inflation than any other major industrial nation with the exception of the U.K. And Italy has consistently shown the highest rates of unemployment until Canada achieved that dubious distinction in 1975 through 1980 and the U.K. took over in 1981.

Serious difficulties besetting the Italian economy include major dependence on imported energy (82 percent of 1980 primary energy requirements), recurrent balance of payments deficits and a large and not easily managed public sector. Her economic program involves widespread indexing of wage rates, which leads to persistent high inflation.

Government efforts to cope with these problems and to maintain sound growth in exports have involved frequent devaluation of the currency—which has helped the competitiveness of Italian goods on the export market, but tended to aggravate already high inflation.

While the problems of the government (including public sector industry) have worsened, private industry has been able to adjust more effectively, and the manufacturing sector has continued to attain significant productivity improvements. The outlook is mixed for the near future. However, Italian exports respond strongly to increases in European demand. Hence, the anticipated recovery in 1983 should improve the Italian economy to some extent. Real GDP is expected to grow over two percent in 1983, but a return to the high productivity growth rates which characterized the Italian economy in the earlier post-war decades is not anticipated.

Economy's Impact upon Productivity Growth

In line with practice in past years, the American Productivity Center has attempted to translate economic facts and assumptions into productivity growth projections. The results are presented in Figures 24 and 25. In the case of the United States, the trend projected is somewhat below the growth rate which might be expected if the "optimistic scenario" is in fact fully realized; but it is certainly higher than the pessimistic one.

The data shown are actuals for 1980 and 1981, estimates for 1982 based on available data for the first part of the year, and estimates for 1983 developed by the OECD and other observers. Estimates for the years 1984 through 1990 are based more on "intuition" than concrete evidence. The *levels* of estimated productivity are in terms of real GDP per hour worked, based on 1975 constant U.S. dollar exchange rates, adjusted for purchasing power parity estimates.

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[1]Output per *employee* levels are sharply different from output per *hour* levels, due to international differences in average hours worked per employee per year. This applies especially in the case of Japan, where average hours in 1979 were 2,147, as compared to 1,593 in the U.K.; 1,612 in the U.S.; 1,724 in Germany; and 1,727 in France.

[2]Kurosawa, Kayukiyo, International Comparison of Labor Productivity, Japan Productivity Center (Tokyo), 1982.

[3]In constant 1973 yen, adjusted for variations in purchasing power parity.

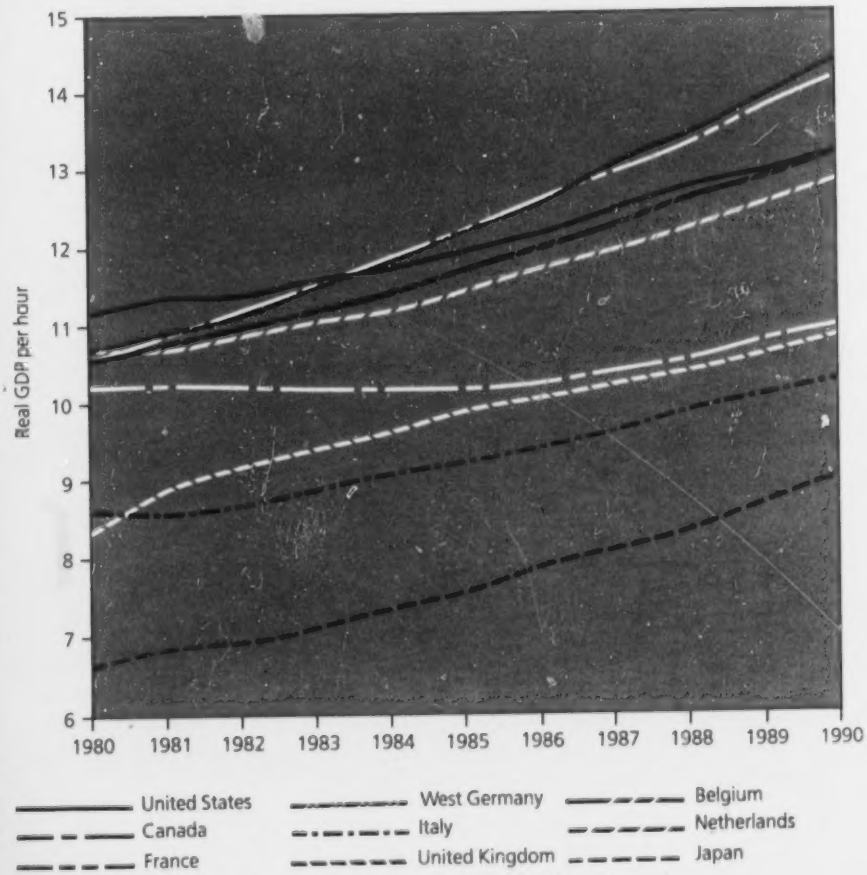
[4]Sadler, George E. and Elliot S. Grossman. Comparative Productivity Dynamics, American Productivity Center (Houston), 1982.

Figure 24 Estimates of productivity growth rates, 1980-90

Country	1980	1981	1982	1983	1984	1985	1986	1987	1988	1989	1990
U.S.	0.2	1.2	−0.1	1.5	1.7	2.0	2.0	2.0	2.0	2.0	2.0
Canada	−1.5	0	−0.2	−0.2	−0.1	0	0.5	1.0	1.5	2.0	2.0
France	1.4	1.7	3.0	2.5	3.0	3.0	3.0	3.0	3.2	3.0	3.2
Germany	1.6	1.6	2.7	2.8	3.0	3.9	3.2	3.3	3.3	3.3	3.4
Italy	4.1	−0.8	1.2	2.3	2.0	2.0	2.0	2.4	2.3	2.0	2.5
U.K.	1.3	6.1	3.5	2.2	2.2	2.0	2.0	2.0	2.0	2.0	2.0
Belgium	2.4	1.7	2.0	2.0	2.2	2.3	2.4	2.4	2.5	2.5	2.5
Netherlands	0.4	0.6	1.25	1.25	1.8	2.0	2.0	2.5	2.3	2.3	2.5
Japan	3.3	2.1	1.7	2.8	3.2	3.2	3.5	3.3	3.5	4.0	4.0

Source: American Productivity Center

Figure 25 Estimates of Real GDP per Hour, Selected Industrial Nations [1]



[1]Real GDP per hour in purchasing power parity for each nation in 1975 dollar price exchange rates.

Source: American Productivity Center

Figure 26 Capital stock and labor productivity 1948-1981

Sector	Output/Hour				Capital Stock/Hour			
	1948-1965	1965-1973	1973-1979	1979-1981	1948-1965	1965-1973	1973-1979	1979-1981
Services	2.3	2.2	0.7	0.3	1.8	2.3	0.6	1.9
Construction	2.6	−0.9	−3.0	−2.4	4.3	2.0	−0.8	1.0
Finance & Insurance	1.3	1.2	−0.1	−0.2	2.8	6.1	5.1	6.5
Mining	4.3	2.4	−5.2	−2.5	6.3	1.7	−3.0	−3.0
Transportation	2.3	2.6	1.2	0.5	2.4	1.3	0.4	5.1
Manufacturing	3.0	2.8	1.5	1.0	2.1	2.5	3.1	5.4
Trade	2.8	3.2	0.8	−0.1	4.0	4.4	1.6	3.5
Public Utilities	6.9	3.8	0.8	−2.3	4.0	4.3	2.8	−0.2
Agriculture	5.3	5.0	3.6	5.1	5.7	5.0	3.0	2.6
Communications	6.5	4.8	5.8	5.5	6.2	3.9	3.2	3.0

Source: American Productivity Center

Figure 27 Impact of investment on GNP growth 1971-1981

Country	GNP Growth (%)	Investment as % of GNP
U.S.	3.0	17.6
Germany	2.5	21.9
U.K.	1.5	18.2
Japan	4.7	33.4
Italy	2.8	20.2
France	3.3	22.3

Source: OECD

Figure 28 Ratio of current dollar gross fixed capital investment to GNP

Period	United States	France	West Germany	Italy	Nether-lands	United Kingdom	Japan	Canada
1970	17.4	23.3	25.6	23.1	25.6	18.3	35.4	21.0
1976	17.0	23.2	20.6	20.1	20.8	18.9	31.3	23.5
1977	18.2	22.2	20.7	19.6	21.0	17.9	30.5	23.1
1978	19.0	21.4	21.2	18.7	21.3	18.0	30.8	22.7
1979	19.0	21.3	22.5	18.9	21.2	17.8	32.1	23.1
1980	17.8	21.6	23.4	20.0	21.0	17.8	32.0	23.6
1981	17.1	21.2	22.9	20.3	19.9	16.5	31.0	24.5

Source: Department of Commerce, "International Economic Indicators"

Figure 29 Ratios of savings to disposable income, major industrial nations

Period	United States	France	West Germany	Italy	Nether-lands	United Kingdom	Japan	Canada
1970	8.0	16.7	14.6	21.6	14.0	9.3	18.2	5.3
1976	6.9	16.4	14.7	22.9	14.6	11.9	22.4	10.0
1977	5.6	16.6	13.6	22.5	12.0	10.8	21.0	9.7
1978	5.2	17.5	13.7	23.8	11.9	12.7	20.6	10.8
1979	5.2	15.9	14.4	25.3	11.6	14.1	18.6	10.3
1980	5.6	14.3	14.5	22.0	12.4	15.1	19.4	10.1
1981	5.3	14.8	15.2	N.A.	N.A.	13.7	N.A.	11.6

N.A. = Not Available
Source: Department of Commerce, "International Economic Indicators"

Figure 30 National R & D funding by source

	Average Annual Rate of Change							
	Current $				Constant $[1]			
Year	Total	Federal	Industry	University Non-Profit	Total	Federal	Industry	University Non-Profit
1960-67	14.3	17.4	5.3	14.6	12.1	15.2	3.3	12.4
1967-75	5.2	4.4	4.6	9.8	−0.6	−1.2	−1.2	3.9
1975-79	11.9	12.3	12.1	9.9	4.4	4.7	4.9	2.6
1979-81*	10.7	9.5	14.0	12.3	1.2	0.2	4.2	2.7

[1] 1972 Dollars
* = Estimated
Source: American Productivity Center

Figure 31 National R & D and GNP

Year	R & D[1]	Real[1] GNP	R & D as a % of GNP
1960-67	12.1	4.9	2.82
1967-75	−0.6	2.2	2.53
1975-79	4.4	4.5	2.25
1979-81*	1.2	0.9	2.31

[1] Annual Percentage Rates of Change in 1972 Dollars
* = Estimated
Source: National Science Foundation

Figure 32 Research and development spending by use

	Annual Average Rates of Change					
	Current $			Constant $		
Year	Basic	Applied	Develop.	Basic	Applied	Develop.
1960-67	14.3	6.8	7.4	12.1	4.7	5.3
1967-75	5.2	6.4	5.1	−0.6	0.6	−0.8
1975-79	11.9	11.6	11.3	4.6	4.4	4.2
1979-81*	10.7	12.0	13.6	1.2	2.4	3.9

* = Estimated
Source: National Science Foundation

Figure 33 Percentage distribution of government R & D by selected nations for 1978

Country	National Defense	Space	Energy	Economic Develop.	Health & Human Res.	Advance-ment of Knowledge
U.S.	49	12	11	9	15	4
Japan	2	6	10	22	6	54
U.K.	52	2	8	13	4	21
Germany	12	4	14	15	11	45
France	33	5	7	21	6	24

Source: National Science Foundation

Figure 34 Rates of change in output per hour during business-cycle phases, private business sector 1945-1980

Expansion Phase			Contraction Phase		
Period	Average Annual Percent of Change		Period	Average Annual Percent of Change	
Q = quarter	First Half	Second Half	Q = quarter	First Half	Second Half
4Q 1945-4Q 1948		4.8	4Q 1948-4Q 1949	−2.5	5.1
4Q 1949-3Q 1953	6.0	3.1	3Q 1953-2Q 1954	−1.0	1.0
2Q 1954-3Q 1957	3.5	2.0	3Q 1957-2Q 1958	3.5	3.5
2Q 1958-2Q 1960	4.9	1.3	2Q 1960-1Q 1961	−1.5	2.9
1Q 1961-4Q 1969	4.5	2.1	4Q 1969-4Q 1970	1.6	2.5
4Q 1970-4Q 1973	3.5	1.2	4Q 1973-1Q 1975	−4.8	−1.5
1Q 1975-1Q 1980	3.7	−0.3	1Q 1980-3Q 1982	0.3	1.4

Source: 1945-75 data—S. Fabricant, Later data—APC

Figure 35 Gross National Product trend in billions 1970-82

Year	Current GNP	Constant GNP[1]
1970	992.7	1085.6
1971	1077.6	1122.4
1972	1185.9	1185.9
1973	1326.4	1255.0
1974	1434.2	1248.0
1975	1549.2	1233.9
1976	1718.0	1300.4
1977	1918.0	1371.7
1978	2156.1	1436.9
1979	2413.9	1483.0
1980	2626.1	1480.7
1981	2937.7	1502.6
1982[e]	3073.9	1479.4

[e] = Estimated
[1] 1972 $
Source: Economic Report of the President.
The Conference Board.

Figure 36 The anatomy of U.S. post war inflation

Price Index	1950-65	1965-73	1973-78	1978-80	1980-82[e]
GNP Implicit Deflator	2.2	4.5	7.7	8.7	7.5
Consumer Prices	1.8	4.4	7.7	12.4	7.8
Personal Consumption Deflator	2.1	4.0	7.8	9.5	8.0
Producer Prices	1.3	3.7	9.8	12.6	5.9

[e] = Estimated
Sources: Departments of Commerce and Labor

Figure 37 Declining rates of growth: output, productivity and real earnings

	Average Annual Percentage Change			
	1948-1973	1973-1978	1978-1980	1980-1981
Real GNP	3.8	2.7	1.5	1.5
Employment	1.5	2.3	1.5	1.1
Employment per capita	0.03	1.5	0.6	−0.5
Unemployment per capita	5.4	6.2	10.0	6.3
GNP per capita	2.3	2.0	1.2	1.0
GNP per employee	2.3	0.5	0.0	1.4
Hours per employee	−0.4	−0.6	−0.7	−0.3
Output per employee	2.9	1.0	−2.1	1.8
Real Average Hourly Earnings	3.0	0.7	−2.2	−0.7
Total Factor Productivity	2.3	0.6	0.05	0.4

Source: Economic Report of President, Bureau of Labor Statistics, American Productivity Center.

Figure 38 Energy trends in the United States

	Average Annual Percentage Change		
	1960-70	1970-79	1979-81
Real relative price energy[1]	−1.4	8.9	19.8
Real relative price of imported crude oil[2]	−2.3	16.8	33.3
Oil Consumption	4.0	2.5	− 6.8
Oil Imports	6.5	9.3	−16.4
Cost of Oil Imports	6.6	37.5	15.0

[1]BLS Producers Price Index for fuels deflated by implicit price deflator.
[2]Price of imported oil deflated by implicit price deflator.
Source: Congressional Budget Office

Figure 39 International comparisons of economic performance 1960-1982

	Percentage Growth of GNP			Percentage Change Consumer Price Index			Average Rate of Unemployment		
Country	1960-73	1973-80	1980-82*	1960-73	1973-80	1980-82*	1960-73	1973-80	1980-82*
U.S.	4.0	2.4	0.0	3.1	9.1	8.1	4.9	6.8	8.6
Germany	4.8	2.3	0.1	3.2	4.7	5.3	0.8	3.3	5.6
Japan	10.6	4.4	2.5	6.0	9.6	3.9	1.3	2.0	2.2
France	5.7	2.9	0.8	4.6	10.9	13.9	2.1	5.0	7.8
Canada	5.4	2.7	0.8	3.1	9.3	11.2	5.3	7.3	8.8
Italy	5.2	2.8	0.6	4.5	16.8	18.5	3.2	3.8	9.0
U.K.	3.3	0.5	−0.8	4.7	16.0	10.9	2.9	5.4	11.3

Source: New York Stock Exchange
OECD

Figure 40 Growth rates for real Gross National Product and labor productivity

	1973-78		1978-81	
Country	Real GDP	GDP Per Hour	Real GDP	GDP Per Hour
U.S.	2.8	1.6	2.1	1.0
Canada	3.2	2.1	1.7	0.1
Japan	4.4	6.1	4.7	6.3
Belgium	4.3	6.9	2.5	5.0
France	3.5	5.0	2.3	2.7
West Germany	2.5	5.2	2.5	2.9
Italy	2.7	2.5	3.4	4.9
Sweden	2.1	1.4	1.4	2.7
U.K.	1.6	1.5	0.1	3.2

Source: Angus Maddison, New York Stock Exchange and Bureau of Labor Statistics

Figure 41 Rates of change in real business output, total factor input, and productivity, 1960-79

	1960-1973 Rates of Change				1973-1979 Rates of Change			
Country	Real Prod.	Total Factor Input	Total Factor Pty.	Pty. Growth as % of Product Growth	Real Prod.	Total Factor Input	Total Factor Pty.	Pty. Growth as % of Product Growth
Japan	10.8	4.7	6.1	56	4.2	2.4	1.8	43
France	5.8	1.9	3.9	67	3.2	1.1	2.1	66
Canada	5.8	3.1	2.7	47	3.2	3.3	−0.1	−3
Italy	5.6	0.0	5.6	100	2.6	1.8	0.8	31
W. Germany	4.6	1.4	3.2	70	2.2	0.1	2.1	95
Sweden	4.2	0.7	3.5	83	0.1	−0.2	0.3	*
U.S.	4.4	2.3	2.1	48	2.9	2.3	0.6	21
U.K.	2.9	0.8	2.1	72	0.5	0.2	0.3	60
AVERAGE	5.5	1.9	3.7	68	2.4	1.4	1.0	42

*Not meaningful due to small magnitude of the data.
Source: American Productivity Center

Figure 42 International comparisons of post war growth rates in manufacturing industry output per hour 1950-81, (average annual percentage change)

Country	1950-67	1967-73	1973-78	1978-81
United States	2.5	3.6	1.6	1.0
Canada	4.0	5.1	2.1	0.1
Japan	9.5	11.0	6.1	6.3
Belgium	N.A.	9.0	6.9	5.0
Denmark	4.1	8.1	5.8	3.3
France	5.0	6.1	5.0	2.7
Germany	6.0	5.3	5.2	2.9
Italy	6.4	7.2	2.5	4.9
Netherlands	5.2	9.3	5.7	3.2
Sweden	4.7	6.9	1.4	2.7
United Kingdom	2.8	4.3	1.5	3.2

Source: Angus Maddison

Figure 43 International comparisons of growth rates, 1970-1981

	Manufacturing Output/hr[1]			Manufacturing Exports[2]			Unemployment[3]		
Country	1970-76	1976-79	1979-81	1970-76	1976-79	1979-81	1970-76	1976-79	1979-81
United States	3.6	1.5	1.0	10.9	6.4	3.1	6.1	6.7	6.8
France	5.2	5.2	1.5	12.1	11.5	−13.5	3.2	4.9	6.9
Germany	5.6	4.7	1.9	14.0	14.9	−5.6	1.6	4.3	4.4
Italy	5.3	3.8	3.9	10.6	9.7	−16.8	3.3	3.7	4.0
Netherlands	7.3	5.0	1.1	12.4	7.0	−12.8	N.A.	4.2	5.4
U.K.	3.4	2.7	3.1	1.7	9.1	−15.8	4.0	5.5	7.6
Japan	7.2	7.9	4.9	12.5	10.2	15.3	1.5	2.1	2.1
Canada	3.8	2.4	−0.7	6.0	4.9	0.2	6.1	7.8	7.5

N.A. = Not Available
[1]Average Annual Rates of Change
[2]Annual Growth Rates Deflated for Inflation
[3]Average Annual Rate
Source: International Economic Indicators Department of Commerce

Figure 44 Exports of manufactured goods for selected years 1970-1981 (in billions of U.S. dollars)

Year	U.S.	France	Germany	Italy	Nether-lands	U.K.	Japan	Canada
1970	29.3	13.5	30.7	11.1	6.8	16.6	18.1	9.7
1975	71.0	39.6	79.6	29.2	19.4	37.0	53.2	16.7
1976	77.2	42.5	90.7	31.3	22.3	39.0	64.6	20.6
1977	80.2	48.7	104.3	38.1	23.9	47.4	77.7	23.1
1978	94.5	58.8	125.2	47.6	27.8	57.6	94.2	27.1
1979	116.7	75.6	150.6	60.1	34.5	70.2	99.1	30.2
1980	144.0	84.0	166.9	66.2	38.3	86.4	124.4	33.9
1981	154.3	75.2	150.8	64.5[e]	33.9	74.8[e]	146.9	37.6

[e] = Estimated
Source: Department of Commerce, "International Economics Indicators"

Figure 45 Building blocks of labor cost in eleven nations, selected periods, 1973-1981

	Average Annual Growth Rate 1973-78			Average Annual Growth Rate 1978-81		
Country	Compensation per Hour	− Output per hour	= Unit Labor Costs	Compensation per Hour	− Output per hour	= Unit Labor Costs
United States	9.4	1.6	7.6	10.5	1.0	9.4
Canada	12.4	2.1	10.1	10.5	0.1	10.4
Japan	13.7	6.1	7.2	6.9	6.3	0.6
Belgium	15.3	6.9	7.8	8.6	5.0	3.5
Denmark	14.7	5.8	8.4	10.5	3.3	7.0
France	15.8	5.0	10.3	15.6	2.7	12.5
Germany	10.7	5.2	5.3	8.2	2.9	5.2
Italy	21.2	2.5	18.3	18.9	4.9	13.3
Netherlands	12.6	5.7	6.5	6.3	3.2	3.1
Sweden	15.5	1.4	13.9	9.2	2.7	6.4
U.K.	20.1	1.5	18.3	19.2	3.2	15.6

Source: U.S. Bureau of Labor Statistics

Figure 46 Relative levels of estimated hourly compensation of production workers in manufacturing, selected years for ten nations

	Relative Level of Hourly Compensation (U.S. = 100)[1]						
Country	1960	1965	1970	1973	1975	1978	1980
United States	100	100	100	100	100	100	100
Canada	80	73	83	89	96	92	91
Japan	10	15	24	42	48	67	57
Belgium	31	42	50	80	104	123	129
France	31	40	42	59	73	80	99
Germany	32	45	56	87	98	113	116
Italy	23	36	42	61	73	74	99
Netherlands	26	40	51	82	104	118	119
Sweden	45	60	70	94	113	116	124
U.K.	31	37	35	43	51	51	74

[1]Hourly compensation in national currency rates converted to U.S. dollars at each year's official exchange rates.
Source: Bureau of Labor Statistics

Figure 47 Ratio of gross fixed investment to GDP

Country	1960-73	1973-78	1978-81
United States	5.3	1.7	−2.8
Canada	5.6	2.0	2.4
Japan	13.7	−2.3	0.2
United Kingdom	3.9	3.4	−0.5
France	7.2	0.2	−0.6
West Germany	4.8	1.4	2.5
Italy	4.6	−1.2	2.8

Source: Commerce Department, "International Economic Indicators"

Figure 48 National expenditures for R & D as a percentage of GNP for selected years

Year	France	W. Germany	Japan	U.K.	U.S.	USSR
1964	1.81	1.57	1.48	2.29	2.96	2.87
1967	2.13	1.97	1.53	2.30	2.89	2.91
1969	1.94	2.05	1.65	2.22	2.71	3.03
1972	1.86	2.33	1.85	2.06	2.40	3.58
1975	1.80	2.38	1.94	2.05	2.27	3.69
1978	1.76	2.37	1.93	2.11	2.23	3.47

Source: National Science Foundation

Figure 49 Scientists and engineers engaged in R & D per 10,000 labor force population by country for selected years

						USSR	
Year	France	W. Germany	Japan	U.K.	U.S.	High Est.	Low Est.
1965	21.0	22.7	24.6	19.6	64.1	48.2	44.8
1968	26.4	26.2	31.2	20.8	66.9	58.8	53.5
1972	28.1	36.0	38.1	30.4	58.2	73.2	66.5
1975	29.3	41.0	47.9	31.3	56.4	87.5	78.2
1977	30.3	44.3	49.9	N.A.	57.7	91.5	81.3
1980	N.A.	N.A.	N.A.	N.A.	60.4	96.7	94.9

N.A. = Not Available
Source: National Science Foundation

Figure 50 U.S. patents granted to foreign inventors, selected years

Year	Total U.S. Patents	West Germany	Japan	U.K.	France	Canada	USSR
1966	68405	3981	1122	2674	1435	938	66
1968	59103	3442	1464	2481	1446	897	95
1971	78316	5519	4032	3468	2214	1326	334
1974	76278	6157	5889	3145	2565	1325	492
1976	70219	6179	6543	2391	2407	1192	426
1979	48852	4528	5252	1910	1605	1025	354

Source: National Science Foundation

Figure 51 Comparison of average annual hours worked per person, eight nations, selected years

	Average Hours Worked Per Person					
Year	Japan	France	Germany	U.K.	Nether.	U.S.A.
1870	2945	2945	2941	2984	2964	2964
1913	2588	2588	2584	2624	2605	2605
1929	2364	22.7	2284	2286	2260	2342
1938	2391	1848	2316	2267	2244	2062
1950	2289	1989	2316	1958	2208	1867
1960	2450	1983	2086	1913	2177	1795
1973	2213	1825	1827	1688	1825	1687
1978	2141	1726	1733	1600	1671	1620
1981	2140	1701	1681	1503	1680	1582

Source: Angus Maddison